AMENDMENTS TO THE SPECIFICATION

Please insert the following heading and paragraph beginning at page 1, line 3:

PRIORITY CLAIM

This is a U.S. national stage of application No. PCT//FR03/00849, filed on 17 March 2003. Priority is claimed on that application and on the following application:

Country: France, Application No. 02/03928, Filed 28 March 2002.

The PCT International application was published in the French language.

Please insert the following section heading at page 1, line 4:

BACKGROUND OF THE INVENTION

Please replace the paragraph beginning at page 1, line 18, with the following rewritten paragraph:

When the flexible pipe, regardless of its nature, is subjected to an external pressure Pe that is higher than the internal pressure, axial compression may arise and this is known as the reverse end-wall effect. The reverse end-wall effect has a tendency to compress the armor and to shorten the length of the flexible pipe and increase its diameter, this increase in diameter ~~having~~ has the effect of causing the armors to swell. Under ~~and, under~~ certain conditions, for example with an unsealed external sheath and regardless ~~as to~~ of whether the pipe is straight or curved, the armors can buckle in a radial mode and take on a "bird cage" shape. Another mode of buckling of the tensile armors due to the compressive stresses that they experience due to the reverse end-wall effect is ~~what is~~ known as lateral buckling, which can arise when the flexible pipe is bent and regardless of the condition of the external sheath. This lateral buckling is often accompanied by overlapping of the armor wires of any ply which, when they part laterally under too high a stress, overlap the armor wire next to them.

Please insert the following section heading at page 4, line 17:

SUMMARY OF THE INVENTION

Please replace the paragraph beginning at page 4, line 24, with the following rewritten paragraph:

The subject of the present invention is a device for limiting the lateral buckling of the tensile armor plies of a flexible pipe ~~in accordance with claim 1~~. For limiting the lateral buckling of tensile armor plies of an underwater flexible pipe, that can be used in the offshore oil industry comprising, the plies include from the outside inward, at least one external sheath preferably of a polymer, a first outward retention layer of a defined thickness K_1 wound around an upper, outer tensile armor ply, at least one second inward retention layer of a defined stiffness K_2 wound around one or each of at least one lower inner tensile armor ply. Stiffness K_2 is preferably less than stiffness K_1, i.e., the retention layers outward are less stiff. There is also an internal sheath preferably of a polymer.

Please replace the paragraph beginning at page 5, line 7, with the following rewritten paragraph:

According to another feature of the invention, the second retention layer which is radially more inward and over an inward armor ply has a stiffness K_2 which is greater than the stiffness K_1 of the first retention layer which is radially more outward and over a more outward armor ply, so that a clearance is formed between the upper or outward armor ply and the second retention layer over the lower or inward armor ply during swelling, if swelling occurs. In that way, the two armor plies are independent of one another and the rubbing-together of the armor plies which may occur when the flexible pipe is being bent, is, if not entirely eliminated, at least greatly reduced so that the risk of lateral buckling is greatly reduced.

Please replace the paragraph beginning at page 5, line 23, with the following rewritten paragraph:

Other advantages and features will become apparent from reading about one embodiment of the present invention and from the appended drawings. ~~in which:~~

Please replace the paragraph beginning at page 6, line 1, with the following rewritten paragraph:

BRIEF DESCRIPTION OF THE DRAWINGS

~~figure~~ Figure 1 is a partial perspective view of a flexible pipe equipped with a device as claimed in the invention; and

~~figure~~ Figure 2 is a view in longitudinal section of the pipe of ~~figure~~ Figure 1.

Please replace the paragraph beginning at page 6, line 5, with the following rewritten paragraphs:

The pipe depicted in ~~figure~~ Figure 1 comprises, from the outside inward, at least one external polymer sealing sheath 1, a first radially outward retention layer 2 of total stiffness K1 wound around an upper or outward tensile armor ply 3, a lower or inward tensile armor ply 4 and an internal polymer sheath 5. The tensile armor plies are obtained by long-pitch winding of a shaped metal or composite wire in opposite directions as seen in Figure 1. The structure of a flexible pipe like the one described hereinabove is the simplest that can be produced. Indeed, those skilled in the art know that when the lay angles of the wires that make up the upper 3 and lower 4 armor plies are close to 55°, and are wound in opposite directions, the presence of a pressure vault, like the one depicted in ~~figure~~ Figure 1 [[and referenced]] at reference 6, is not essential. Likewise, just two armor plies 3 and 4 are depicted, although in general other armor plies may be wound around the longitudinal axis of the pipe. The armor ply 3 is said to be the upper one because it is the last or radially outward one, starting from the inside of the pipe, before the external sealing sheath 1. Likewise, when reference is made to a retention layer 2, this means that it may be made up of several bands, ribbons, tapes or unitary elements wound with a short pitch contiguously and/or one over the other, around the upper armor ply 3.

The unitary elements of the retention layers have high longitudinal strength along their longitudinal axis and low longitudinal compression strength. Such a low compression strength is desired so as to significantly reduce the radial clamping forces of the laying tensioners during the various flexible-pipe-handling operations. Thus, the unitary ~~stabilizing~~ elements of the retention

layers may be made of various appropriate materials, for example they may be formed using a woven or nonwoven made of aramid fiber. It is also possible to use a flat textile tape consisting of a more or less rectangular central section and of two longitudinal edges which are thinner than the central section, as described in Patent Application FR 01 10 818 in the name of the applicant company.

The internal polymer sheath 5 surrounds a metal carcass 7 which consists of the short-pitch winding of an interlocked metal strip or shaped wire about the longitudinal axis, the winding angle of which is close to 80 or 90°.

Please replace the paragraph beginning at page 7, line 19, with the following rewritten paragraph:

The flexible pipe thus described, in a simple structure, is said to be a rough bore pipe because it has a metal carcass 7 ~~by way of~~ as its innermost element. Were the flexible pipe not to have a metal carcass and were it to have the polymer sheath 5 as its innermost element, it would then be said to be a smooth bore pipe. Regardless of the type of flexible pipe, the device as claimed in the invention can be used in ~~said~~ the flexible pipe.

Please replace the paragraph beginning at page 8, line 1, with the following rewritten paragraph:

According to the invention, a second, lower, radially inward retention layer 8 is arranged around the lower armor ply 4[[,]]. That ~~said~~ retention layer ~~having~~ has a defined stiffness K_2. Of course, when the flexible pipe has several armor plies lying below the upper armor ply 3, these would be considered to be lower layers and a retention layer of defined stiffness K would be wound around each of them, it being emphasized that the stiffnesses K of each of the lower armor plies could be the same or could differ if necessary. In the preferred embodiment of the invention, the stiffness K_2 of the lower retention layers with respect to the first retention layer 2 considered as being the upper retention layer differs from the stiffness K_1. As a preference, the retention layers 2 and 8 are made of a very strong material such as the

material known by the name of Kevlar and more generally from an aramid. The stiffness K of a retention layer is the constant connecting the maximum swelling of the armor ply retained by said retention layer with respect to its initial position (absolute clearance ΔR) to the pressure P exerted on the armor ply, this being so, in the case of an unsealed sheath, for a straight flexible pipe. This then gives the equation $\Delta R = P/K$. For a given structure, the constant is dependent on the lay angles of the armor plies and on the wrapping angles of the retention layer and on parameters and properties of the material of which the unitary elements that make up the layer used are made. It is determined during the flexible pipe design phase so as to limit the clearance ΔR to below a desired value of "k" times the thickness e of the armor wire of the layer, for example below 0.3e. This maximum clearance is determined for a straight flexible pipe. When the pipe is bent, this clearance is distributed nonuniformly, in a way that can be calculated.